CLAIMS

WE CLAIM:

1. An optical transistor, comprising:

an optical base port for receiving an optical signal (λ_B);

an optical emitter port for generating an amplified replica (λ_E) of the input optical signal;

an optical collector port for generating an amplified inverted replica (λ_C) of the input optical signal; and

a body coupled to the optical base port, the optical emitter port, the optical collector port.

2. The optical transistor of Claim 1, wherein the optical collector port comprises an orthogonally polarized or wavelength shifted optical beam, the orthogonally polarized or wavelength shifted optical beam being collinearly propagating with an amplified signal generated from the optical signal (λ_B).

3. The optical transistor of Claim 1, wherein the optical collector port is positioned in a plane on a wafer and is orthogonally or obliquely propagating relative to an amplified signal generated from the optical signal (λ_B).

4. The optical transistor of Claim 1, wherein the body comprises:

a bottom Distributed Bragg Reflector (DBR);

an active region overlaying the bottom DBR; and

a top (DBR) overlaying the active region.

5. The optical transistor of Claim 4, wherein the body comprises:

a substrate placed underneath the bottom DBR;

a bottom cladding layer overlaying the bottom DBR;

a top cladding layer disposed between the bottom DBR and the active region; and

a confinement layer disposed between the top cladding layer and the top DBR.

6. The optical transistor of Claim 1, wherein the input optical signal propagates horizontally through the active region to generate an amplified replica (λ_E).

7. The optical transistor of Claim 6, wherein the input optical signal propagates horizontally through the active region and vertically through the top cladding layer, the confinement layer, and the top DBR, an amplified inverted replica (λ_C).

8. A method for an optical transistor, comprising:

receiving an input light signal (λ_B) with stimulated emission; and

responsive to the input light signal, generating a first amplified replica light output signal (λ_E); and

responsive to the input light signal, generating a second inverted amplified replica light output signal (λ_C);

wherein the first amplified replica light output signal (λ_E) and the second inverted amplified replica light output signal (λ_C) share a ballast cavity.

9. The method of Claim 8, further comprising: injecting the input light signal (λ_B) that is orthogonal to the second inverted amplified replica light output signal (λ_C).

10. The method of Claim 8, where the first amplified replica light output signal (λ_E) is linear or gain stabilized by either optical feedback of a laser, an injected optical signal, or pump or electrical modulation.

11. The method of Claim 8, where the second inverted amplified replica light output signal (λ_C) is linear or gain stabilized by either optical feedback of a laser, an injected optical signal, or pump or electrical modulation.

12. The method of Claim 8, wherein the input light signal (λ_B) comprises generates an unidirectional signal flow, thereby providing isolation between the input light signal (λ_B) and the second inverted amplified replica light output signal (λ_C).

13. An optical transistor, comprising:

an optical base port for receiving an optical signal (λ_B);

an optical emitter port for generating an amplified replica (λ_E) of the input optical signal;

an optical collector port for generating an amplified inverted replica (λ_C) of the input optical signal;

a body coupled to the optical base port, the optical emitter port, the optical collector port; and

a means to obtain unidirectional signal flow from the optical base port to the optical emitter port or the optical collector port.